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Vol. 70 No. 52 Issue No. 4212 1219-1232 December 27th, 1958

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No. 52 DECEMBER 27th, 1958 Vol. 70

Registered for Transmission as a Newspaper *Price 2s. post free*

A Congenital Muscle Contracture and Chondrodysplasia Syndrome in Cattle

BY

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and

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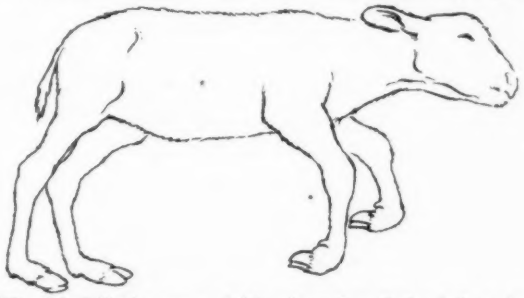
SUMMARY.—Eleven malformed calves were born in a beef herd. The fore-limbs exhibited extreme flexure of the fetlock joint while the hind limbs were flaccid and sickle shaped. The teeth were abnormally calcified. The data suggests that the condition may be inherited as a dominant with a high but incomplete penetrance.

ABOUT 24 hereditary defects have been recorded in cattle in Britain. It seems likely that many more exist and await description. The present paper describes a hitherto unrecorded defect in a beef herd.

Clinical Findings

The 11 affected calves now described were born alive at full term except one which probably died just before parturition. There were no special difficulties at birth and the calves were all of normal size. None of them were able to stand because of the excessive flexibility of the joints of the hind limb and they lay with the neck extended as in partial opisthotonous.

The calves were able to drink when hand fed but none survived for more than 3 days because of the onset of hypostatic pneumonia. It is probable that some would have survived for longer periods with special attention. In all cases the gross abnormalities were similar and were confined to the limbs and teeth. The fore limbs were straight from the shoulder to the fetlock and then turned at right angles in a state of permanent flexion. The flexor tendons appeared to be contracted and the calves were unable to put the soles of their hooves on the ground even after the bodyweight was supported by hand. In several cases it was almost impossible to straighten the fetlock joint and the knee joint was also very rigid.



The hind limbs were sickle shaped and the joints, in contrast to those of the fore limbs, were freely moveable. The collateral ligaments of the hock joint in particular were slack and permitted excessive latero-medial and antero-posterior movement of the limb. The stifle joint was similarly affected but to a lesser degree. The teeth were soft and fleshy and yielded easily in any direction to pressure. They obviously lacked calcification and had the blood-stained gelatinous appearance of foetal teeth.

At *post-mortem* examination all the limb bones were present and were not grossly abnormal in size or curvature. The normal musculature was also present in all four limbs. Abnormal bone formation was, however, observed in the distal extremity of the tibia, the radius and the proximal ends of the metatarsal bones. The epiphyses were normal in shape and size but were abnormally soft and incompletely calcified. Cartilage formation was excessive and the proximal ends of the metatarsal bones separated easily from the shafts 2 days after the bones were removed from the carcase. The shafts of the bones and the marrow appeared to be normal. Although facilities were not available for detailed examination, the bone defects were apparently caused by abnormal chondral ossification rather than by faulty periosteal ossification. The sickle shape of the hind limbs appeared to be mainly due to the improper functioning of the joint ligaments.

Breeding History

The herd consisted of 24 to 30 cows. It was excellently managed and the cows usually calved during the winter. Prior to 1955-56 there was no trouble but at that time a new bull—Bull X—was purchased and was used in the herd. He left 5 affected and 16 normal calves while another bull used in the same year produced 3 normal calves. Bull X was used again the following season and left 6 affected and 9 normal calves. Another bull used in this season left 14 normal and no affected calves. Bull X was then disposed of and no more affected calves appeared in the herd.

If the mates of the bull leaving 14 normals were similar to the mates of Bull X, there would be little doubt that Bull X was responsible for the abnormalities. Of the mothers of these normals, 9 were previous mates of Bull X (5 having previously left defectives, and 4 normals). A further 4 of these mothers were half sisters to 6 mates of Bull X. There can, therefore, be little doubt that Bull X was responsible and that the condition was of genetic origin.

The numbers are too small to demonstrate whether Bull X left affected offspring out of one group of cows but not out of another, and hence whether the females are involved. The fact, however, that the 11 mothers of defectives had 7 different sires suggests that the breeding of the females may not be important.

The ratio of defectives to normals can be tested for the likelihood of a recessive gene being responsible. Over the 2-year period in which Bull X was used, he left 25 normal and 11 affected calves. This is a very high proportion of defectives if a recessive gene is involved. For such a ratio not to depart significantly at the 5 per cent. level from what would be expected if the condition were, in fact, due to a recessive gene, at least two thirds of the mothers would have to be heterozygous. Such a situation might emerge if all the mothers were half-sibs, daughters of a carrier bull. The 28 mothers are, however, the offspring of 16 different bulls. The available data suggest therefore, that the abnormality is not caused by a recessive gene.

If the condition were due to a dominant gene, approximately half of Bull X's calves or 18 should be affected. Eleven were born and this number would be expected only about twice in a hundred times by chance. Furthermore, since Bull X himself was not affected, it does not seem likely that a simple dominant gene is the cause.

The situation is then that an apparently normal bull leaves a high proportion of affected calves from cows to which he is not closely related and also that the proportion of affected calves is too high for recessive gene and too low for a dominant gene. The most feasible explanation is that the defect is caused by a dominant gene with incomplete penetrance.

Discussion

The defective calves exhibit both bone lesions and muscle contractions but without a more detailed pathological study it is impossible to say which is primary. The teeth and bone lesions suggest that the condition is basically one of faulty ossification but skeletal abnormalities are common in congenital defects of muscles. When movement of muscle is hindered during the growth period, the bone development of the affected part is stunted. According to Adams *et al.* (1953) muscular imbalance in a limb is almost invariably followed by bone deformity.

The disease does not resemble any of the muscle contractures previously reported in cattle. The contractures are much less severe than in the type recorded in Jerseys by Mead *et al.* (1943) in which the animals can usually walk on their toes. They are also less severe than in the cases in Holstein—Friesians noted by Hutt (1934) in which the contractures are so great that the limbs are wrapped round the body of the calf. They are also less severe than any of the forms described by Nes (1953) in Scandinavian cattle.

Furthermore, the disease does not greatly resemble any of the congenital bone abnormalities in humans described by Stein *et al.* (1955). It resembles achondroplasia in that endochondral ossification seems to be involved but micromelia is absent and the skull is normal. It differs from *osteogenesis imperfecta* in that periosteal ossification is apparently normal and fractures are absent.

The disease would also be unusual if it is in fact inherited as a dominant with a high degree of penetrance since most of the defects that have been reported in cattle are due to recessive genes, although some, such as the Dexter bulldogs, are due to semi-dominant genes. Many bone defects in humans, however, are inherited in a dominant manner.

Acknowledgment.—Thanks are due to Mr. A. L. Wilson for assistance during the investigation.

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A New Bacon Factory in Kenya

BY

A. GINSBERG

Department of Veterinary Services, Kenya

ON the Equator, 8,000 ft. above sea level, overlooking the great Rift Valley, a new bacon factory has started production.

"Uplands Ltd." is no newcomer to the meat industry, having started some 50 years ago as a small pork butchery. As the Colony and its neighbouring territories developed, the demand for bacon and pork products steadily increased, with the result that more and more departments had to be added to the old building, turning it into a labyrinth in which up-to-date production was almost impossible. By 1950 the Kenya Pig Industry Board was forced to decide whether to construct a new plant or to curtail drastically the production of pigs throughout the Colony. By an overwhelming majority the shareholders of Uplands voted in favour of the former alternative to allow for the expansion of the pig industry. Difficulties, however, were many, and it was not until the beginning of 1956 that the building plan was accepted.

To-day, after 20 months of intense effort, a bacon plant, comparing favourably with British and Continental factories, has started production. Its weekly capacity is at present 2,000 baconers, though provision has been made to allow for further expansion as it becomes necessary.

The works are situated on a plateau which is crossed by the main railway line leading from Uganda, through Kenya's foremost agricultural provinces, to the port of Mombasa on the Indian Ocean. A road links it with Nairobi, 28 miles away, and with the new airport at Embakasi which handles large consignments of "Uplands" products destined for the Central African territories and the Middle East.

The new plant has been erected next to the old works. In spite of the fact that it is a single storey construction, the killing floor has been placed above the edible by-products departments. This feature permits rapid and hygienic disposal by gravity of all offal and condemned parts to appropriate departments on the ground floor.

The pigs arrive by train and are then inspected in a yard adjoining the railway siding. Those found healthy are sent to the spacious, cool and well-ventilated lairages. Those which are suspected, or show symptoms of disease, are directed to the "suspect pen" for detailed examination. Casualties are removed for emergency slaughter by a special truck, and pigs which have died during transport are taken to the *post-mortem* room for autopsy.

After a necessary rest, the pigs are driven from the lairages along a serpentine ramp to the waiting pens on the first floor of the factory. The slaughter is preceded by electric stunning (though space has been provided for the installation of CO_2 machinery should this method emerge successfully from its present experimental stage). The stunned pig is elevated and then moved by gravity to the sticker's post, where it is caught by a bleeding conveyor leading towards the scalding tank. The blood, destined for animal feeding meal, is allowed to flow into a bleeding trough connected with ground floor receptacles by a chute. The bled pigs are lowered automatically into a scalding tank, where they are submerged and propelled by an IWEL device towards the dehairing machine, the scraping table and the second hot-water tank. All subsequent cleaning and butchering operations take place on a moving conveyor, save in two instances, when the carcases are split and, again, when they are weighed and graded. The conveyor and overhead round bar is 9 ft. 6 in. above floor level and all labour employed along the dressing line works on raised steel platforms to facilitate the maintenance of cleanliness (Fig. 1).

The abdominal viscera are placed, after removal, on an inspection table from which the "fit" stomachs and intestines slip into a chute leading to the commodious gut-cleaning department; the "unfit" pass down another chute to an isolation room, to which all condemned offal and parts are despatched from the killing floor. The regular removal of these inedible by-products to the disposal plant is carried out by means of a special truck. The thoracic viscera are hung on a synchronised pluck conveyor and, after inspection, the "fit" are dropped through a chute to the sorting department, where they are washed, hung on pluck carriers and transferred to a separate offal cooler. After the carcases have been split, weighed and graded, the heads are removed and placed on a table for inspection for *C. cellulosae* and other abnormalities. When declared "fit," they, too, pass to the sorting department on the ground floor. At this point, the carcases undergo a final veterinary inspection and those with a clean record have their leaf fat removed. This is dropped to the lard rendering

FIG. 1.—Killing floor.

FIG. 2.—De-elevator from killing floor to cold store and curing cellars.

department. A de-elevator now lowers the bacon sides to the cold store (Fig. 2), from which they are moved to the cutting-up room and curing cellars. As tropical conditions necessitate a dry cure, floor slabs take the place of the usual curing vats.

Pig carcases destined for manufacture are transferred to a separate cold store reserved for the small goods section. This well-equiped department, running parallel to the cold store and curing cellars, has been allocated considerable space to allow for future expansion.

Gammons and shoulders are removed from the cutting-up room to the ham department, situated to the left of the cold store and curing cellars. This is composed of large cooling, curing, maturing and drying rooms.

These three production units lead in a straight line to the packing and despatch hall. They are divided by two wide corridors, and under one of these run all the main electric cables and drains, the latter leading to a central sewer which opens into a sewage disposal plant.

The building is severely functional and simple in design (see Fig. 3). The structure is of reinforced concrete filled with local stone. The interior wall surfaces are terrazo finished to a height of 6 ft. and above that there is a pleasing light-coloured paint, the colours varying from department to department. The floors are granolithic screeded or tiled and well drained. Full use has been made of natural light but sufficient and well-placed artificial lighting ensures good working conditions at all times. The ratio of floor space to machine installation has been carefully maintained for the sake of hygiene, and ample room and passage-ways have been provided around all machines, scalding tanks and conveyors.

Despite the need for stringent economy, the abattoir installations, cold store and small goods machinery are all of the latest design. Items of machinery unnecessary in the opening stage will be ordered as funds become available. Every care has been taken to guarantee the highest possible standard of hygiene. Hot and cold water points and facilities for washing the hands are available throughout the plant, and spacious changing rooms, showers and lavatories are provided for factory staff and labour.

Technical advice throughout the building stages was given by the Meat Inspection section of the Department of Veterinary Services, Kenya, which also prepared the final layout. The building was designed by a well-known Nairobi firm of architects. The abattoir and cold storage installations and machinery were supplied by leading British firms.

The old factory is now under reconstruction and, when ready, will be used as a porker slaughterhouse and canning plant. The existing by-product plant is being rebuilt and enlarged to meet increased production.

The inspection of meat and supervision of factory hygiene is carried out by the Department of Veterinary Services. The staff for this is composed of a Veterinary Officer, a European Health Inspector and 8 African Meat Inspectors. Procedure of inspection and judgment is based upon a code passed by the Legislative Council of Kenya in 1955, with rules modelled upon the Meat Legislation of Germany and the U.S.A. The macroscopic inspection carried out on the killing floor is confirmed, whenever necessary, by a laboratory examination on the spot. If for any reason a diagnosis cannot

(*Concluded at foot of col. 1, page 1223*)

FIG. 3.—Main corridor.

Enzyme Test Papers for the Estimation of Glucose in Urine, Blood, and Lachrymal Secretion

BY

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AND

J. S. WILKINSON

Clement Stephenson Research Scholar

SUMMARY.—The use of enzyme test papers as a quantitative test for glucose in canine urine, blood, and lachrymal secretion is evaluated. The tests are not sufficiently accurate to warrant their introduction as routine quantitative aids.

Introduction

THE use of enzyme test papers for the detection of glycosuria in the dog has already been described (Stratton, 1957), and their introduction as a routine screening test suggested (Stratton, 1958). The manufacturers of TesTape suggest that it may be used as a semi-quantitative test in urine, and supply a colour scale for comparison. Hunt, Gray and Thorogood (1956), and Tunbridge, Paley, and Coulson (1956) found that it was not a satisfactory quantitative test in human urine.

Baron and Oakley (1957) reported favourably on the use of TesTape as an approximate quantitative test on human plasma or serum. Kohn (1957) developed a technique using Clinistix for the approximate estimation of glucose in human whole blood, and found it satisfactory.

Lewis (1957) found that Clinistix were of value in the examination of human lachrymal secretion, a positive reaction being associated with a blood glucose level of 200 mg. per cent. or more.

In view of the value of such simple tests to the clinician it was decided to investigate their use in the diagnosis and control of diabetes mellitus in the dog.

Methods

Urine: TesTape was used in routine urine analysis in addition to Benedict's qualitative test or Clinitest. If the urine was found to contain glucose this was estimated with Benedict's quantitative reagent. In addition standard solutions of glucose were prepared in normal canine urine, and tested with TesTape. The end of a piece of tape about 2.5 cm. long was dipped into the specimen and withdrawn. After 1 minute the colour obtained was compared with the colour scale provided, graduated 0, 1/10 per cent., ¼ per cent., ½ per cent. and 2 per cent. or more.

Blood: Venous blood samples were taken from normal and diabetic dogs. One drop of blood was placed on the impregnated tip of the Clinistix, after 20 seconds it was washed off under a stream of tap water for a period of not more than 5 seconds. The blue colour revealed was then compared with a 3 colour scale graduated −, +, and +++. Colours between − and + were recorded as ±, and colours between + and +++ as ++. Blood glucose values were determined using an adaptation of the method described by Lee (1954).

Lachrymal Secretion: TesTape or Clinistix were applied to the conjunctiva of the lower eyelid until the tip was moistened. After 1 minute the colour obtained was compared with the colour scale. TesTape was used in only a few cases, and the results were recorded simply as positive or negative. These tests were used in the dogs from which blood samples were taken, and also as a screening test on dogs attending the Beaumont Animals' Hospital clinic.

Results

Urine: The results obtained are shown in Table I. Forty-two specimens were examined. Fifteen specimens known to contain more than 2 per cent. of glucose gave TesTape results as follows: 1 at ¼ per cent., 4 at ½ per cent., and 10 at 2 per cent. or more.

TABLE I

URINE

Per cent. glucose	Number of specimens	TesTape 1/10%	¼%	½%	2% or more
0·10	5	5			
0·25	7	3	4		
0·50	4		3	1	
1·00	7		1	5	1
2·00	4			2	2
Over 2%	15		1	4	10
Total	42				

A New Bacon Factory in Kenya—*Concluded.*

be reached locally, further investigations can be carried out at the Research Laboratory of the Veterinary Department at Kabete.

Kenya can claim to possess not only the most highly situated, but one of the most modern bacon plants in the world, an asset which should provide a very great impetus to her development and to her export trade.

Acknowledgment.—This article has been published by kind permission of the Director of Veterinary Services.

TABLE II
BLOOD AND TEARS

Blood glucose mg. per cent. (Lee)	Number of specimens	Clinistix									TesTape	
		Blood					Tears				Tears	
		+++	++	+	±	−	+++	++	+	±	−	+	−
50 (0·05%)	1			1						1			
60	2			1		1				1	1		
65	1			1						1			
75	1					1					1		
80	4			2		1			3	1			
85	2			2					2		1		
87·5	2			1		1			1		2		
90	2			1	1						2		
100 (0·10%)	2			2							2		2
103	1			1					2				
105	2			1							2		
110	4		2	2					1	1	2		2
115	1				1					1			
120	5			3		2	1	1	1		3		
125	1			1		1			1				
130	1				1								
150	4		3	1						1	3		2
160	1			1					1				
172	1								1				
185	1			1					1				
195	1		1								1		1
200 (0·2%)	1		1								1		1
210	1			1						1		1	
240	1			1					1				
242	1			1						1			
250	2	1	1				1	1				1	
272	1	1						1					
275	4	1	1	2					2		2		1
280	1			1							1		1
285	1	1							1				
300 (0·3%)	1	1							1				
320	1	1							1				
350	1	1							2				
370	1	1									1		
385	1			1					1				
490	1	1				1							
Total	59												

Blood and Lachrymal Secretion: The results obtained are shown in Tables II and III. Table II gives the results of the examination of 59 blood samples. It also shows that there is frequently no correlation between the blood glucose level as determined by Lee's method and the results given by Clinistix with whole blood and with lachrymal secretion. When Clinistix were applied to whole blood it can be seen that a − result was only given if the blood glucose level was below 125 mg. per cent., and that a +++ result was only given if the blood glucose level was 250 mg. per cent. or higher. However, blood glucose levels below 125 mg. per cent. may give ±, +, or ++ reactions, and above 250 mg. per cent. may give + or ++ reactions. These results are summarised in Table IV. Glucose appears very rapidly in the lachrymal secretion when given by intravenous injection, and persists for some time after blood levels have dropped to normal. Irrigation of the conjunctiva with isotonic saline to remove glucose from the lachrymal secretion was unsuccessful.

Table III gives the result of screening the lachrymal secretion of 21 dogs. Eleven tests were positive,

TABLE III
CLINISTIX APPLIED TO LACHRYMAL SECRETION AS A SCREENING TEST IN UNSELECTED DOGS ATTENDING THE BEAUMONT ANIMALS' HOSPITAL

Number of dogs	Clinistix				
	+++	++	+	±	−
21	3	0	4	4	10

1 of these was from a known case of diabetes mellitus, 1 dog had conjunctivitis, 2 were from boxers and 2 from spaniels. Subsequent examination did not reveal any further cases of diabetes mellitus amongst these 21 dogs.

Discussion

The authors did not investigate the use of enzyme test papers as quantitative tests upon serum or plasma since it was felt that clinicians would be impatient of the delay inevitable in the preparation of these fluids.

Urine: TesTape is obviously not satisfactory as a quantitative test for glucose in canine urine. This

TABLE IV
SUMMARY OF RESULTS SHOWN IN TABLE II

Blood glucose mg. per cent.	Number of specimens	Clinistix										TesTape	
		Blood					Tears					Tears	
		+++	++	+	±	−	+++	++	+	±	−	+	−
Below 80	5			3		2				3	2		
80–120	25		2	15	2	4	1	1	10	3	14		4
125–200	11		5	4	1	1			4	1	5		4
Over 200	18	9	2	7			2	2	9	2	4	2	2
	59												

confirms the findings in human urine reported by Hunt *et al.*, and Tunbridge *et al.*

Blood: In our opinion Clinistix do not give a sufficiently accurate result to warrant their use as a routine quantitative test for glucose in whole blood. The fact that no blood glucose level below 250 mg. per cent. gave a +++ reaction, and no level above 130 mg. per cent. gave a negative reaction might be of value in an emergency.

Lachrymal Secretion: The results obtained from the examination of the lachrymal secretion of the dog bear no relation to the blood glucose level. It appears that the presence of a conjunctivitis or ectropion, as found in spaniels and boxers, influences the test. This test is therefore of no diagnostic value.

Acknowledgments.—The authors wish to thank Messrs. Eli Lilly and Company Limited for the supply of TesTape, and Messrs. Ames Company (London) Limited for the supply of Clinistix.

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Abnormalities of the Sexual Organs in the Buffalo-cow

BY
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SUMMARY.—1. *The incidence of abnormalities in the sexual organs of the buffalo-cow was studied in* 606 *animals.*

2. *Different types of abnormalities were detected in* 106 *genitalia,* i.e. 17.49 *per cent. of the total material examined.*

VARIOUS investigators have determined the causes of sterility in cattle, but little is known of the causes in the buffalo-cow. Although Bhattarchary *et al.* (1954) and Hafez (1954) reported defects and disorders of various types found in buffalo-cows examined after being slaughtered, there is still a great need for more investigations to determine the incidence of sexual disorders in this species.

Material

The genitalia of 606 buffalo-cows of unknown history were examined before and after slaughter. *Ante-mortem* examination was carried out by rectal palpation and the clinical diagnosis was verified at slaughter.

Results

The results of examination revealed the presence of various sexual disorders which are recorded in the following table, the percentage of each abnormality being expressed in relation to the total number of genitalia examined.

TABLE
SHOWING THE INCIDENCE OF DIFFERENT GENITAL ABNORMALITIES IN THE BUFFALO-COW

Abnormalities	Number of cases	Percentage
Subfunctioning ovaries	16	2·64
Ovarian hypoplasia	2	0·33
Cystic ovaries	10	1·65
Cystic corpus luteum	1	0·17
Bursal adhesions	6	0·99
Hydro-bursitis	10	1·65
Cysts in bursa	8	1·32
Hydrosalpinx	18	2·97
Hydrosalpinx associated with hydro-bursitis	10	1·65
Pyometra	15	2·47
Pyometra with mummified foetus ...	5	0·82
Tumour of the uterus	2	0·33
Tumour of the cervix	2	0·33
Double cervix	1	0·17
Total	106	17·49

Out of the 16 cases with sub-functioning ovaries 6 were right-sided, 7 left-sided, and 3 bilateral. Ovarian hypoplasia was detected in the right side

An Attenuated Strain of Duck Hepatitis Virus

BY

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SUMMARY.—This paper reports experiments and observations on a strain (TN) of duck hepatitis virus which was found to have become attenuated for ducklings, following propagation in chick embryos.

Ducklings inoculated with this strain rapidly developed resistance to inoculation with a virulent strain and also when exposed to natural disease on infected premises.

Puncture of the foot web with mounted sewing machine needles which had been wetted with a suspension of the TN virus provided an easy and satisfactory method of immunisation of young ducklings.

Mortality from all causes during the seven day period after inoculation by foot stab with the TN virus was 5 out of 631 ducklings.

Direct duckling to duckling passage of a sample of TN 57 virus showed definite evidence of enhancement in virulence.

DUCK virus hepatitis is an acute infectious disease of young ducklings. If infection takes place during the first 2 or 3 weeks of life mortality may be very high. Age resistance is rapidly acquired and this gives complete protection against the development of symptoms by about 5 weeks of age. The practical problem of control is therefore limited to the protection of ducklings during the first 4 to 5 weeks of life.

The disease is principally of importance to commercial table duckling producers. In order to maintain a continuous output of fat ducklings it is the practice of the commercial producers to hatch or purchase young ducklings throughout the whole or greater part of the year. On the larger farms the intake may be many hundreds each week. This continuous introduction of susceptible stock favours the spread and persistence of disease. It has been the general observation that once the disease has been introduced on to a farm successive batches of ducklings will sicken and that disease will persist despite efforts to disinfect premises and equipment and to isolate new batches of ducklings.

The virus does not appear to be egg-borne. Some success in reducing losses has resulted from advice to move ducklings hatched on infected premises direct from the incubators to clean premises or to divert newly purchased ducklings to clean premises. A substantial degree of resistance will have been acquired by about 4 weeks of age. The ducklings can then be moved on to the infected fattening fields

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Abnormalities of the Sexual Organs in the Buffalo-cow —*Concluded.*

only. It was found that in cases of cystic ovaries, 5 cases were right-sided, 3 cases left-sided, and 2 cases bilateral. On the other hand, a cystic corpus luteum was found in the left side in one case. Out of the 6 cases affected with bursal adhesions, 3 were in the left side, 2 in the right side, and one bilateral. Five hydrobursitic cases were in the left side, 2 in the right, and 3 bilateral. Cysts in the bursa were found in 8 cases, the size of the cysts varying from that of a pea to that of a walnut. Two were found bilaterally, 4 in the right side, and 2 in the left. Hydrosalpinx was found in 18 genitalia, 7 cases were in the right side, 9 in the left, and 2 were bilateral. In 10 cases of the genital organs affected with hydrosalpinx and hydrobursitis, 4 were in the left side, 3 in the right, and 3 were bilateral. Pyometra existed in 15 genitalia, the pus contents varying from 1 to 5 litres. Pyometra was also seen in 5 cases with macerated foetus; the age of the foetus varying from 2 to 4 months.

Tumours were observed in 2 uteri. In one case it occurred in the body of the uterus and the other in the right cornu. Tumours were also seen in the cervical canal of two other genitalia. In one case there was a genital organ with double cervix and os uterus each leading to its cervical canal and cornu.

Discussion

This investigation has shown that pathological changes in the Fallopian tubes and ovarian bursa are quite common. On the other hand, they do not necessarily always cause sterility as strong adhesions were noted in pregnant buffalo-cows. The high incidence of pyometra and pyometra associated with macerated foetus in the buffalo-cow may be due to venereal infection, bad hygienic condition at parturition, and retained afterbirth. The high percentage of subfunctioning ovaries may be attributed to malnutrition. Occurrence of cystic ovaries and ovarian hypoplasia may be due to congenital factors.

Acknowledgment.—I am greatly indebted to Dr. A. Sabraf, Professor of Pharmacology, Faculty of Veterinary Medicine, Cairo University, for supervising the work and for his valuable advice and encouragement. The willing co-operation of veterinarians in abattoirs is gratefully acknowledged.

References

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with little danger of heavy losses. If this system is practised the movement of vehicles, crates and staff between the brooding and fattening premises is likely sooner or later to result in infection spreading to the brooding premises.

Recovered ducklings do not appear to remain carriers but the virus will survive outside the duckling under favourable conditions for at least several months. Thus even if infected premises are depopulated of ducks the disease may recur when restocking takes place.

Success in reducing mortality has resulted from the injection of serum collected from survivors at the time of slaughter (Levine & Fabricant, 1950). The practice was to inject 0.5 ml. serum intramuscularly into ducklings at risk, immediately after the first sign of disease. Because the incubation period is brief, *i.e.*, 1 to 3 days and the disease spreads with great rapidity, speed in administering serum is essential if it is to be worthwhile.

The cost and practical problems involved in the collection, processing and holding of sera and in the diagnosis and timely administration of serum were so great that alternative methods of control were sought.

Asplin (1956) reported that if breeding ducks were inoculated with duck hepatitis virus they subsequently conveyed a passive resistance to their progeny which was sufficient to protect them from infection during the first weeks of life. Such a practice using a virulent virus could not be recommended for use in the field since it would provide a hazard to young susceptible ducklings. The purpose of this paper is to report observations on an attenuated strain of virus (TN) with particular reference to its use for control of disease in young ducklings and for the immunisation of breeding stock.

All strains of hepatitis virus which have been isolated at this laboratory have been obtained from dead ducklings submitted for diagnosis. It is, therefore, not unexpected that all strains tested have proved pathogenic on first isolation. A series of 17 newly isolated strains were inoculated into groups each of 5 or 6 ducklings 7 to 10 days of age. Mortality occurred in all groups and varied from one to six.

A strain of virus isolated in September, 1953 was propagated by serial passage in embryonated fowl eggs. Early passages were made at weekly intervals. Embryonic fluid was harvested on the sixth day after inoculation and subinoculated into 10-day embryonated eggs on the following day. The virus was grown in this way through 28 passages. In the writer's absence it was carried through a further, small but unknown number of passages, and was then stored in the frozen state for 11 months.

Propagation in hen eggs was recommenced in ducklings inoculated intramuscularly with TN5 and the number of subsequent passages in chick embryos is indicated by the figure following the designation TN.

No ducklings were inoculated with material from the original field cases but as reported (Asplin & McLauchlan, 1954) a proportion of 1- and 2-day-old ducklings died following exposure to or inoculation with, embryonic fluid of the 6th, 17th and 22nd chick embryo passage.

That the strain may have become attenuated was suggested when 6 3-day-old and 6 10-day-old ducklings inoculated intramuscularly with TN5 failed to sicken. This was confirmed in a further experiment using TN6. Fourteen 7-day-old ducklings were inoculated intramuscularly and placed in contact with 26 ducklings of the same age. None sickened. Seven days later both inoculated and contact ducklings were challenged with a virulent strain of virus, again none sickened.

Methods and Materials

The ducklings used in this work except where otherwise stated were Khaki Campbells bred at the laboratory.

The TN strain of duck hepatitis virus was propagated in the allantoic cavity of 10-day embryonated fowl eggs. The embryonic fluid was harvested 48 hours after inoculation and was lightly centrifuged.

In the early passages of the TN virus few embryos died within 3 days of inoculation and some lived for as long as 8 to 10 days. With continued cultivation in chick embryos there was a progressive change in mortality pattern so that by the TN90 passage most 10-day embryos died within 48 hours.

The virulent strain (H) of hepatitis virus used for challenge tests was isolated from a field outbreak in 1954 and has been maintained by direct duck to duck passage. For the preparation of an inoculum, liver was removed from several ducklings immediately after death. This was ground with sand and suspended in 1 per cent. horse serum broth to make a 10 per cent. suspension of liver. After light centrifugation it was distributed in 5 to 10 ml. bottles and stored in the frozen state. When titrated in young ducklings 0.1 ml. of this suspension diluted 10^{-6} was infective.

For challenge inoculations 0.1 ml. of the 10 per cent. liver suspension was injected into the leg muscles. Most deaths from hepatitis occurred 20 to 48 hours after inoculation, by the fifth day after inoculation most survivors appeared completely healthy.

Experimental

Onset of Resistance Following Inoculation with the TN Virus

Thirty-four 7-day-old ducklings were inoculated intraperitoneally with 0.1 ml. of TN8 virus in undiluted infected chick embryonic fluid. At varying intervals after inoculation ducklings were withdrawn and challenged with the virulent H virus, a similar number of inoculated controls were challenged at the same time. The results are shown in Table I. It will be seen that 3 out of 9 ducklings challenged 24 hours after inoculation with TN8 died whereas 7 out of 9 of the controls died. All inoculated ducklings challenged 2 to 6 days after inoculation remained well. (See Table I overleaf.)

These results indicated that infection with the TN strain rapidly interfered with infection by the virulent strain.

TABLE I

THE RESISTANCE OF DUCKLINGS INOCULATED WITH THE TN_8 VIRUS INTRAPERITONEALLY TO SUBSEQUENT CHALLENGE WITH THE VIRULENT H STRAIN INTRAMUSCULARLY

Interval between inoculation with TN and challenge with H. virus (days)	Mortality following challenge	
	TN inoculated	Controls
1	3/9	7/9
2	0/5	3/5
3	0/5	4/5
4	0/5	3/5
5	0/5	4/5
6	0/5	2/5

TABLE II

RESISTANCE OF DUCKLINGS INOCULATED WITH THE TN VIRUS TO CHALLENGE WITH VIRULENT DUCK HEPATITIS VIRUS

Virus	Route	Number of ducklings	Mortality
H	Intramuscular	12	10
TN 17	,,	13	0
TN 17 followed by H 24 hours later	,, ,,	13	0
TN 17 H simultaneously	,, Intraperitoneal	11	3

A second experiment using 6-day-old Pennine ducklings confirmed the above finding (Table II). In this experiment an additional group of 11 ducklings were inoculated simultaneously with the TN and H strains, the TN was injected intramuscularly and the H intraperitoneally. It is interesting to note the mortality (3 out of 11) in this group in relation to the mortality (10 out of 12) in the group receiving the H strain alone. Unfortunately in this experiment neither virus suspension had been titrated and so the relationship between the infecting doses was unknown. It should also be pointed out that the group receiving the H strain alone were injected by the intramuscular route whereas the group receiving the simultaneous dual infection received the TN strain by the intramuscular route and the H strain by the intraperitoneal route.

Foot web Inoculation with the TN Virus

It was found that an infection with the TN strain could be established in young ducklings by stabbing the foot web with sewing-machine needles which had been dipped in a suspension of virus.

The virus suspension used was the undiluted embryonic fluid of 12-day chick embryos which had been inoculated 48 hours previously. This work was carried out with groups of ducklings. It is thus not known if infection was established in all ducklings as a direct result of the inoculation procedure or whether only a small proportion are infected directly and that it then spreads by contact. From the practical point of view, it would seem that the result was that infection was established in most or all ducklings within a short time.

Various groups of ducklings which were inoculated by the foot stab method were challenged with the H virus at intervals. Groups of susceptible controls were included. The results are set out in Table III. It will be noted that where the interval between "foot stab" and challenge is 6 hours there was no marked reduction in mortality. Ducklings challenged 2 days or more after foot stab show striking resistance.

Mortality in Ducklings Following Inoculation by Foot Stab with the TN Virus

Ducklings inoculated with a virulent strain of

TABLE III

RESISTANCE OF DUCKLINGS INOCULATED WITH THE TN VIRUS BY THE FOOT WEB METHOD TO CHALLENGE WITH VIRULENT DUCK HEPATITIS VIRUS

TN Passage	No. of duck-lings	Age (days)	Interval between inoculation and challenge	Mortality following challenge with H strain	
				TN inoculated	Controls
TN 40	10	10	6 hours	8/10	11/12
,, 39	12	7	24 ,,	7/12	2/4
,, 40	40	7	36 ,,	6/40	6/8
,, 38	26	12	2 days	0/26	11/14
,, 39	77	7	2 ,,	6/77	5/8
,, 40	34	7	3 ,,	1/34	20/20
,, 41	69	7	4 ,,	2/68	20/20
,, 42	50	5	4 ,,	2/48	17/19
,, 44	46	7	4 ,,	0/45	18/30

TABLE IV

MORTALITY IN DUCKLINGS DURING THE 7-DAY PERIOD FOLLOWING INOCULATION WITH VARIOUS PASSAGES OF THE TN VIRUS

Passage	Number of ducklings	Age/days	Mortality
TN 19	18	10	0
,, 30	35	14	0
,, 34	20	9	0
,, 36	10	2	0
,, 46	45	1	1
,, 47	12	7	0
,, 48	38	6	0
,, 49	16	7	0
,, 50	10	2	1
,, 51	10	2	1
,, 53	10	2	1
,, 54	9	5	0
,, 55	11	3	0
,, 56	12	6	1
,, 57	10	10	0
,, 58	12	7	0
,, 59	10	7	0
,, 61	6	8	0
,, 63	5	10	0
,, 65	6	8	0
,, 66	6	9	0
,, 77	26	9	0
,, 80	32	9	0
,, 81	10	9	0
,, 82	10	9	0
,, 83	21	12	0
,, 84	8	9	0
,, 85	20	9	0
,, 87	11	5	0
,, 88	13	4 and 11 days	0
,, 89	7	9	0
,, 91	20	9	0
,, 92	14	14	0
,, 93	14	14	0
,, 94	15	14	0
,, 95	20	7	0
,, 96	20	14	0
,, 97	12	7	0
,, 98	12	12	0
,, 99	15	4	0
,, 100	20	7	0
Total	631		5

hepatitis virus may be expected to die 20 to 70 hours later. Losses more than 5 days after inoculation are infrequent.

Numerous groups of young ducklings have been inoculated by foot stab at the Laboratory with embryonic fluid of different egg passages of the TN virus. Table IV shows the mortality in ducklings which were kept 7 days or longer following inoculation.

TABLE V

MORTALITY IN DUCKLINGS IN CONTACT WITH TN-INOCULATED DUCKLINGS

Passage	Age of ducklings	Number of ducklings inoculated	Number of ducklings in contact	Mortality in contact ducklings
TN 6	7	14	40	0
,, 19	10	18	10	0
,, 36	9	2	24	1
,, 57	10	10	41	0
,, 80	9	32	128	0
,, 81	9	10	48	0
,, 82	9	10	53	0
		96	344	1

Mortality in Contacts to TN Inoculated Ducklings

In various groups a proportion of ducklings were left uninoculated to determine whether the virus would spread by contact and whether the contact ducklings would sicken. The results are shown in Table V. During the 7-day period after inoculation 1 of 344 contacts died. That the virus spread by contact was demonstrated by isolation of virus from the livers of contact ducklings. The results of these tests showed that whereas the virus frequently spreads by contact it did not invariably do so and thus vaccination of a proportion of the ducklings in a batch is not to be recommended.

Enhancement in Virulence of the TN Strain as the Result of Passage through Ducklings

Two experiments were carried out to determine if the TN virus would become enhanced in virulence by passage through ducklings.

The first experiment was initiated with virus of the TN 19 egg passage which was inoculated intramuscularly into 18 10-day-old ducklings. Three days later 10 7-day-old ducklings were placed in the brooder with the inoculated ducklings. On the following day the original inoculated ducklings were removed. Two days later a third group of ducklings were introduced and the same procedure of 24 hours direct contact with the second group repeated. Results are shown in Table VI. The experiment was discontinued when it was shown that contact spread had not occurred to ducklings of passages 6 and 7.

TABLE VI

ENHANCEMENT IN VIRULENCE OF THE TN VIRUS AS RESULT OF CONTACT TRANSMISSION

Passage	Number of ducklings	Age	Mortality
	18	10 days	0
1	10	7 ,,	0
2	9	15 ,,	2
3	8	8 ,,	0
4	8	11 ,,	1
5	11	7 ,,	2
6*	11	10 ,,	0
7*	16	8 ,,	0

* These groups did not become infected.

In the second experiment, virus of the TN 57 egg passage was passed serially by intramuscular injection through 24 groups of ducklings. In the first 3 passages non-inoculated contact ducklings were included. Transmission was made by injection of a pooled liver suspension of one or more ducklings of the previous passage. Where possible the liver specimens were taken from ducklings which died. If none had died or those which had died were in a decomposed state when found, 2 or more ducklings were killed on the 5th or 6th day after inoculation to provide the inoculum for the next passage; the mortality is shown in Table VII. There is little doubt that passage of the virus resulted in an enhancement of virulence of the TN virus.

There is no published information on the serologi-

TABLE VII

ENHANCEMENT IN VIRULENCE OF THE TN VIRUS AS RESULT OF SERIAL PASSAGE BY INTRAMUSCULAR INJECTION

Passage	Number of ducklings	Age (days)	Mortality
	10	10	0
	41 (in contact)		0
1	12	14	0
	12 (contact)		0
2	8	1	0
	8 (contact)		0
3	8	14	0
	18 (contact)		0
4	26	11	1
5	10	8	3
6	11	10	0
7	21	10	0
8	25	8	6
9	23	10	1
10	25	7	2
11	10	13	0
12	12	9	1
13	10	8	0
14	12	10	0
15	8	7	0
16	9	7	3
17	6	7	0
18	6	8	0
19	32	7	10
20	23	7	0
21	28	8	7
22	24	9	5
23	31	10	15
24	24	18	7

cal identity of different strains of duck hepatitis virus. The first strain isolated in England was neutralised by serum supplied by Dr. E. Dougherty from Long Island, N.Y.

Serum prepared by inoculation of growing ducklings with this English strain, neutralised strains of virus isolated from 15 different outbreaks in Norfolk. Cross neutralisation tests were not carried out.

The TN virus was derived from this first confirmed outbreak of disease in England. The results of the neutralisation tests provided a basis for believing that immunisation with the TN strain would confer protection against the field disease.

As stated, earlier work had shown that inoculation of breeding ducks with live virus stimulated the production of antibody which was passively transferred to the newly hatched duckling through the egg and secondly that inoculation of young ducklings with the attenuated TN virus rapidly protected them against the virulent disease. It seemed that these methods either alone or in combination could be used to reduce losses on farms where the disease was a persistent problem. These methods have been used in a field trial on infected premises in Norfolk. The results will be assembled for publication. For the present it may be of interest to describe the course of an outbreak of hepatitis on one farm for which accurate figures of mortality before and during the outbreak are available. These are shown

TABLE VIII

REDUCTION OF MORTALITY ON NATURALLY INFECTED PREMISES FOLLOWING INOCULATION OF THE TN VIRUS

Date purchased as day olds	No. of duck-lings	Mortality*	Mortality per cent.		
May 2nd	2,350	134*	5·7	Hepatitis first confirmed in group hatched May 23rd	Not vaccinated
,, 9th	2,750	173*	6·3		
,, 16th	3,100	118*	3·8		
,, 23rd	3,452	311*	9·0		
,, 30th	3,600	210	5·9		
June 6th	3,150	238	7·6		
,, 14th	3,350	650	19·4		
,, 20th	3,900	1,602	41·1		
,, 27th	3,950	1,369	34·7		
July 4th	2,750	1,221*	44·4		
July 18th	1,800	80	4·4	Vaccinated at 3 days of age	
,, 24th	2,980	132	4·4	Vaccinated in hatchery	
Aug. 1st	3,626	215	5·9		
,, 8th	3,623	201	5·6		
,, 15th	2,306	106	4·5		
,, 22nd	2,056	96	4·7		
,, 29th	1,600	100	6·2		

* Indicates mortality from time of purchase to 4 weeks of age. In all other groups the figures show mortality during first 3 weeks of life.

in Table VIII. Hepatitis was first confirmed in 3-week-old ducklings in the group hatched on May 23rd, 1956. There is evidence for believing that this was the first infected group on the premises. The affected ducklings were in groups which had recently been moved into grass runs from the permanent buildings. In subsequent weeks the disease spread to younger ducklings housed in a cafeteria and in spite of efforts to limit its spread soon built up to cause substantial losses in 4 successive weeks.

On July 21st, 1,800 ducklings were vaccinated by foot stab with the TN virus. On July 24th and 25th 4,200 breeding ducks on the premises were inoculated intramuscularly with 0.5 ml. undiluted embryonic fluid from infected chick embryos. During the succeeding 6 weeks all ducklings hatching from eggs which were laid before vaccination of the breeding stock or during the 2 weeks following vaccination were "foot stabbed" with TN virus immediately after removal from the incubator.

It will be seen that mortality fell to the level at which it had been immediately before the appearance of hepatitis.

After 6 weeks—when it was anticipated that newly hatched ducklings would be receiving protective antibody through the egg, the vaccination of day-olds ceased.

There was no recurrence of normal losses.

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News and Comment

IN PARLIAMENT

Swine Fever

On December 11th, MR. J. E. B. HILL asked the Minister of Agriculture whether he was aware that the closing of pig markets in Norfolk was causing considerable difficulty and loss, especially to farmers who breed pigs for sale as stores; and whether he will modify the swine fever restrictions so as to permit the sale of store and other pigs which have been vaccinated against swine fever in a manner approved by him.

MR. GODBER replied that he regretted the hardship caused by infected area restrictions to store pig producers and others in central and eastern Norfolk. Vaccination properly carried out conferred immunity from swine fever on healthy pigs not exposed to infection for 28 days before and 14 days after vaccination. Unfortunately these conditions were not always fulfilled; and apart from this, immune pigs might still carry contaminated material. The opening of markets in the infected area to vaccinated pigs would therefore involve a risk of spreading infection.

Sheep Worrying, Kent

SIR A. BOSSOM asked the Minister of Agriculture how many authorised payments of reward for information in the case of sheep worrying have been made in the country of Kent in the last 12 months.

MR. GODBER replied that his Ministry did not make or authorise such payments, and he assumed that the question referred to the offer of rewards by the Kent Branch of the National Farmers' Union for information in cases of sheep worrying. He regretted that he had no information as to the number of cases in which such payments had been made.

National Service and Veterinary Surgeons

On December 12th, MR. HECTOR HUGHES and SIR F. MEDLICOTT asked the Minister of Labour if he is aware that the present rules relating to the call-up of veterinary surgeons and their assistants deprives the public of services which are badly needed; if he will relax them in the public interest; and if he will apply this relaxation to the case of the Aberdeen veterinary assistant, of which he has notice, and whose application for deferment was postponed on technical grounds.

MR. IAIN MACLEOD replied that the rules relating to the call-up and indefinite deferment of qualified veterinary surgeons, including qualified assistants, are aimed at providing the maximum assistance to agricultural veterinary practice, consistent with meeting the requirements of the Royal Army Veterinary Corps for a small number of qualified men holding National Service commissions. He did not feel that he would be justified in relaxing these rules any further.

The veterinary assistant referred to had been told that he could apply for postponement of call-up on grounds of hardship, but he had informed the Ministry that he did not intend to exercise this right. He had therefore been called up and now held a National Service commission in the Royal Army Veterinary Corps.

THE JUBY TRAP

In announcements made by the Ministry of Agriculture on approved humane traps to replace the gin, the price of the Juby trap has been quoted as "probably 19s. 6d. each." A modified version of the trap is now being made which is on sale at the reduced price of 12s. 9d. The modified version operates on the same principle as the earlier model but its superficial appearance has been changed. The traps are obtainable from Messrs. Gilbertson & Page of Hertford or through retailers.

The Juby trap is approved under the Spring Traps Approval Order, 1957, for (a) killing or taking rabbits in rabbit holes; and (b) killing or taking grey squirrels and stoats, weasels, rats and mice, and other small ground vermin in artificial tunnels constructed for the purpose.

UNIVERSITY NEWS

Cambridge

Results of the First Part of the Veterinary Examination held in December:—

Passed in all sections

J. M. J. Best, B.A., Trinity Hall; C. R. Chandler, B.A., Emmanuel; T. L. R. Cromwell, B.A., Sidney Sussex; F. G. Davies, B.A., St. Catharine's; C. M. Groocock, B.A., Trinity; M. E. Hugh-Jones, B.A., Christ's; B. Jeffrey, B.A., St. John's; B. R. Loveday, B.A., Downing; R. S. Millard, B.A., Pembroke; C. J. Randall, B.A., Queens'; D. H. Steven, B.A., King's.

R. K. Medd, B.A. (Selwyn), passed in two sections.

B. R. Loveday was awarded special merit.

R. B. Blatcher, B.A. (St. John's), passed in Section 1, Principles and Practice of Veterinary Medicine, thereby qualifying for his Vet.M.B. degree. He was admitted to membership of the Royal College of Veterinary Surgeons at a ceremony held in Cambridge on Saturday, December 13th.

Mr. Gaspar Szep and Mrs. Judith Iffy from Hungary, who have been following courses at Cambridge for the Royal College of Veterinary Surgeons Diploma under By-law 95, passed the Final Examination and were admitted to the Royal College of Veterinary Surgeons by Professor Beveridge as delegate of the President, at a ceremony held at the School of Veterinary Medicine on Saturday, December 13th. At the same ceremony Mr. Mahammed Yusuf (Liverpool) and Mr. Sadiq Ali (London), who were also successful in the Final Examination, were admitted to membership of the Royal College.

PERSONAL

Marriage

MASON—EVEMY.—On Saturday, December 13th, 1958, in Taunton, Roger S. Mason, B.V.SC., M.R.C.V.S., of Lower Hayne, Corfe, Nr. Taunton, Somerset (late of Kenya), to Shirley Beryl Evemy, 40, North Street, Taunton (late of Cape Town). Forwarding address: The Standard Bank of South Africa, Nairobi, Kenya.

Births

BROCKLESBY.—On December 14th, 1958, at the Maternity Hospital, Birmingham, to Jennifer, wife of D. W. Brocklesby, M.R.C.V.S., of E.A.V.R.O., Muguga, Kenya, a daughter, Sarah Katherine.

CASPARI.—On December 16th, 1958, to Margaret (*née* Davis) and Ernest Caspari, M.R.C.V.S., at Rosehill, Dorking, a daughter, Amanda Anne, sister for Georgina Mary.

KEELING.—On December 10th, 1958, to Joanna, wife of Michael Keeling, M.R.C.V.S., of Helliscote, Odiham, Hants., a sister for Richard (Anna Louise).

TURNER.—On December 4th, 1958, at The Tors, Lapford, Crediton, Devon, to Joan, wife of Barré Turner, B.V.M.S., M.R.C.V.S., a son, Michael.

COMING EVENTS

January

8th (Thurs.). Additional Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

16th (Fri.). Annual General Meeting of the Mid-West Veterinary Association at the Berkeley Café, Clifton, Bristol, 2.15 p.m.

21st (Wed.) 10th Anniversary Dinner-Dance of the Centaur Society at the Berkeley, Bristol.

30th (Fri.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

Annual General Meeting of the Yorkshire Veterinary Society in Leeds.

ADVERTISER'S ANNOUNCEMENT

THE DISTILLERS COMPANY (BIOCHEMICALS) LIMITED announces the introduction of a new pack of "Distivit" B_{12} Veterinary (Injection of vitamin B_{12}). The new pack contains a 10-ml. vial containing 1,000 μg. vitamin B_{12} per ml.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Cumberland. Rose Castle Farm, Dalston, Carlisle (Dec. 15).

Northants. Cotton Farm, Ringstead, Kettering (Dec. 15).

Perth. North Littleton, Rattray, Blairgowrie (Dec. 15).

Fowl Pest

Herts. Kelshall Farms, Manor Farm, Kelshall, Royston (Dec. 12); 19, Brookfield Lane, Aston, Stevenage; Briar Patch, Berry Lane, Mill End, Rickmansworth (Dec. 13); Vine Cottage, Aston, Stevenage (Dec. 15).

Kent. Sarnden Farm, Benenden, Cranbrook (Dec. 14).

Lincs. Dove House Place and Mill Farm, Marston, Grantham; Glebe Farm, Marston (Dec. 14); Thaddens House, Marston, Grantham, (Dec. 15).

Norfolk. Hill Farm, Morley St. Peter, Wymondham (Dec. 12); Rosedale, Deopham Green, Deopham, Wymondham; Hall Farm, Colney, Norwich (Dec. 15).

Suffolk. Fernside, Walsham le Willows, Bury St. Edmunds (Dec. 14).

Swine Fever

Bedford. Grange Farm, Melchbourne (Dec. 15).

Cambs. Wanganui, Fordham Road, Soham, Ely (Dec. 15).

Devon. Zeal Farm, Shillingford, Tiverton; Charlescombe, Stoke in Teignhead, Newton Abbot (Dec. 12); Great Hackworth Farm, Tedburn St. Mary, Exeter (Dec. 15).

Essex. Frenches Farm, Great Bardfield, Braintree; 1, Council Cottages, Hempstead, Saffron Walden; Draco, Burnt Heath, Ardleigh, Colchester (Dec. 12); Lynton, Lower Road, Little Hallingbury (Dec. 15).

Lancs. Moorville, Moorside Lane, Woodplumpton (Dec. 15).

Norfolk. Newgate, Kirby Cane, Bungay (Dec. 12); Church Farm, Great Witchingham, Norwich; Holgate Farm, Bunwell, Norwich; High Mill Road Allotments, Cobholm, Great Yarmouth (Dec. 15).

Suffolk. Bays Farm, Forward Green, Earl Stonham, Stowmarket (Dec. 15).

Surrey. Rushetts Farm, Smallfield, Horley (Dec. 15).

Letter to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Systemic Treatment of Dermatophytoses

Sir,—In the course of a search for new chemotherapeutic remedies for the treatment of dermaphytoses of man and animals, it was observed in April, 1956, that griseofulvin, a substance produced by the growth of *Penicillium janczewskii* (Brian, Curtis & Hemming, 1946; Brian, 1949) is able beneficially to influence lesions produced by *Trichophyton mentagrophytes* on guinea-pigs when administered orally or intraperitoneally.

The untreated experimental lesions run an acute inflammatory course, beginning to regress after about 9 days. When griseofulvin is given daily from the time of infection the lesions fail to develop, and when it is given orally at the level of 25 mg. per kg. from the third or even the fifth day from infection, by which time lesions are well established, rapid resolution occurs.

It is believed that this work was the first to achieve the successful treatment of a dermatophyte infection by a systemically-administered drug and is the first report of the utility of griseofulvin in fungoid disease of animals. A private report has indicated that Dr. J. C. Gentles, of the Department of Bacteriology, Glasgow University, has quite independently obtained similar results. Whether griseofulvin will be suitable for the treatment of similar infections in clinical practice is not yet certain.

Yours faithfully,
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June 25th, 1958.

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———. (1949). *Ann. Botany N. S.* **13.** 59.

[Since this letter was received for publication (June 25th) the following reports on griseofulvin have appeared: Gentles, J. C. (1958). *Nature.* **182.** 476; Lauder, I. M., & O'Sullivan, J. G. (1958). *Vet. Rec.* **70.** 949; Williams, D. I., Marten, R. H., & Sarkany, I. (1958). *Lancet.* **2.** 1212.—*Editor.*]